

# Complicated Replanted Finger, 34 Years after Revascularization

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**Summary:** Merely a few reports of late failure (later than the 7th postoperative day) of a digital replantation can be found in the literature. Discussions of the factors that might cause a late failure are concise. To our knowledge, there are no reports of failure in literature as late as the case we are presenting. An 87-year-old white man was diagnosed with acute complications of a digital replantation, 34 years after initial surgery. Ultrasound examination and an arteriography demonstrated occlusion of the arterial anastomosis. The patient's surgical file revealed scars of former replantation surgery of both the index and the middle finger. In the latter, 1 artery and 2 veins were anastomosed. Considering the age and comorbidities of the patient, revascularization of the finger was not performed. Local wound care and analgesic drugs were prescribed. After initial deterioration and ulceration, gradual improvement was noticed. Total wound healing occurred at 3 months after the initial consultation. Compared with free flap surgery in general, finger replantations are at a higher risk of late complications because digital neovascularization is directly correlated to the contact surface area. This contact surface is usually larger in other free flaps. Furthermore, diseases that deteriorate circulation most likely affect the short- and the long-term survival of a digital replantation. From this point of view, performing both volar digital arterial anastomoses, whenever possible, might reduce early as well as late failure in replantation surgery. (*Plast Reconstr Surg Glob Open* 2020;8:e3246; doi: [10.1097/GOX.0000000000003246](https://doi.org/10.1097/GOX.0000000000003246); Published online 25 November 2020.)

**E**xtensive research has been performed, evaluating factors affecting early digital replantation survival. Late complications have been poorly described. To our knowledge, there are no complicated digital

replantations in literature as late as in the present case. Occlusion of the anastomosis 34 years after initial revascularization caused acute ischemia and ulceration of the affected digit.

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## CASE PRESENTATION

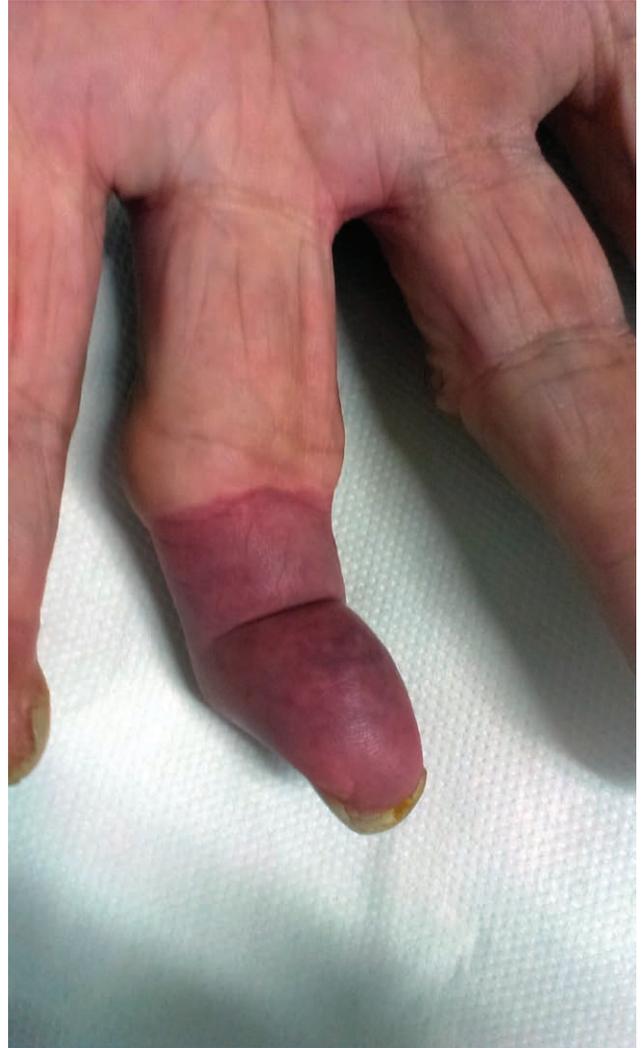
### Primary Admission

An 87-year-old white man was referred to our hospital because of increasing pain of the right middle finger. Symptoms started 3 days earlier, without an obvious cause. His medical record contained a double finger replantation, arterial hypertension, intermittent atrial fibrillation, significant atherosclerosis, and aortic stenosis. Home medication consisted of a calcium channel blocker and a beta blocker. There was no history of tobacco use. Upon clinical examination, a well-demarcated ischemic zone was found in the right middle finger, extending distally from the initial replantation scar (Figs. 1, 2). The finger was cyanotic and cold; the patient felt painful on palpation; and capillary refill testing was over 5 seconds. No other signs of peripheral embolism were found. Ultrasound examination revealed an intact radial digital artery running up to its trifurcation at the level of the distal interphalangeal

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**Fig. 1.** Palm view of the right hand.



**Fig. 2.** Magnified palm view of the right middle finger, demonstrating a well-demarcated ischemic zone, extending distally from the initial replantation scar.

joint, although without detectable internal flow distal from the replantation scar. The ulnar artery had never been repaired at surgical replantation. Recent occlusion of the radial digital artery seemed an obvious cause of the acute ischemia. The patient was discharged from the hospital with analgesic drugs, and was advised to keep the finger warm at all time. Inspection of the patients' surgical file revealed a sawing accident at the age of 53 years. A successful replantation of both the index and middle fingers was performed by a senior plastic surgeon in our hospital. The report mentioned anastomosis of 1 artery and 2 veins in the middle finger.

#### Evolution

One week after primary admission, progressive ischemia and dorsal digital ulceration were assessed (Fig. 3). An arteriography of the right upper limb illustrated occlusion of both digital arteries, moderate hyperemia, and limited collateralization in the affected finger. Anastomotic stenosis accelerated the development of collateral blood flow, although insufficient when the occlusion occurred.

An expectative treatment (local wound care to prevent infection, keeping the finger warm) was decided, considering that revascularization of the finger in the given patient was not opportune, nor desired. Weekly follow-up revealed deterioration of the ulcer at first, until gradual signs of healing occurred. Complete wound healing occurred 3 months after initial referral (Fig. 4).

## DISCUSSION

#### Early Failure

Multiple factors affecting early digital replantation survival have been evaluated. One of the first factors identified is the microsurgical technique.<sup>1</sup> The administration of heparin (unfractionated or low molecular weight) is subject to debate, and the evidence of its benefit on the success rate of digital replantation is low.<sup>2</sup> The perivascular infiltration of botulinum toxin in flap and replantation surgery has been proved effective in animal models.<sup>3</sup>



**Fig. 3.** Dorsal view of the right middle finger, 1 week after primary admission: progressive ischemia and dorsal digital ulceration were assessed.



**Fig. 4.** Dorsal view of the right middle finger, 3 months after initial referral: total wound healing occurred.

At this moment, large series confirming this benefit in humans are lacking. Another important factor is the ischemia time, which is inversely correlated to the success rate of digital replantation. The risk for replantation failure increases whenever 12 hours of cold ischemia time is exceeded. In a more recent manuscript, however, Cavadas et al.<sup>4</sup> found no significant difference in survival, between immediate and overnight delayed replantations. The type of injury plays a role as well. Crush and avulsion injuries have a worse prognosis than guillotine type of amputations, and hand surgeons are advocated to use interpositional grafts whenever necessary.<sup>5</sup> Previous studies have shown that the number of vessel anastomoses was a significant predictor of a successful outcome, whereas the negative effect of smoking on replant survival could not be indisputably demonstrated.<sup>6</sup>

#### Late Complications

Less research has been performed, studying the late complications of a digital replant. In a case series, Dufy et al. described a patient, in whom failure of the replanted finger started not earlier than 2 weeks after initial surgery.<sup>7</sup> Another patient with acute ischemia 10 years after revascularization of a thumb was described by Couceiro et al.<sup>8</sup> Both patients were active smokers. Since a digital replantation is technically a free flap, the manuscript of Salgado et al. is valuable in this context: A total of 10 cases of late arterial inflow loss (mean of 53 days postoperative) were identified and examined, of which 5 survived.<sup>9</sup> Of the 10 cases, 5 survived, 1 sustained partial thrombosis, and 4 were completely lost. The condition and quality of

the recipient site are important for the survival of these flaps. Ischemia, infection, irradiation, and scarring at the wound bed have a negative influence on flap-neovascularization, compared with healthy recipient sites. In the case of a digital replantation, another factor plays a role: the contact surface of the wound bed is relatively smaller and consequently provides less possibility for neovascularization and makes it more susceptible for late complications. Furthermore, diseases that deteriorate peripheral circulation, like atherosclerosis, connective tissue diseases, autoimmune diseases and diabetes mellitus, most likely reduce the short- and long-term survival of finger replantations. In our case, acute ischemia occurred 34 years after replantation. Most likely, atherosclerosis caused occlusion of the vascular anastomosis, and acute ischemia leads to occlusion of the middle finger. Performing both volar digital arterial anastomoses whenever possible might reduce this risk.

#### CONCLUSIONS

Since the first successful microvascular replantation of an amputated thumb by Komatsu and Tamai in 1965, digital replantation has become a common procedure worldwide.<sup>10</sup> Early failure has been studied intensively. With time, an increasing number of cases of late complications will be reported. Since the contact surface of the replant with the wound bed is small when compared with that of the regular free flaps, there is less potential for neovascularization. Collateralization is consequently insufficient and makes a digital replant more susceptible to late complications. Furthermore, an arterial

anastomosis is not less affected by peripheral arterial disease than previously untraumatized arteries. Both arguments are in favor of performing both digital arterial anastomoses whenever possible, to reduce the risk for late complications.

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### REFERENCES

1. Acland R. Thrombus formation in microvascular surgery: an experimental study of the effects of surgical trauma. *Surgery*. 1973;73:766–771.
2. Lin PT, Wang SH, Chi CC. Low molecular weight heparin for prevention of microvascular occlusion in digital replantation. *Cochrane Database Syst Rev*. 2020;4:CD009894.
3. Segreto F, Marangi GF, Signoretti M, et al. The use of botulinum toxin in flap surgery: a review of the literature. *Surg Innov*. 2019;26:478–484.
4. Cavadas PC, Rubí C, Thione A, et al. Immediate versus overnight-delayed digital replantation: comparative retrospective cohort study of survival outcomes. *J Hand Surg Am*. 2018;43:625–630.
5. Lee ZH, Klifto CS, Milone MT, et al. Survival after digit replantation and revascularization is not affected by the use of interpositional grafts during arterial repair. *Plast Reconstr Surg*. 2019;143:551e–557e.
6. Shaterian A, Rajaii R, Kanack M, et al. Predictors of digit survival following replantation: quantitative review and meta-analysis. *J Hand Microsurg*. 2018;10:66–73.
7. Duffy FJ Jr, Concannon MJ, Gan BS, et al. Late digital replantation failure: pathophysiology and risk factors. *Ann Plast Surg*. 1998;40:538–541.
8. Couceiro J, Moledo E, Sanmartín M. Acute ischemia of a thumb 10 years after revascularization. *J Hand Surg Eur Vol*. 2015;40:866–868.
9. Salgado CJ, Smith A, Kim S, et al. Effects of late loss of arterial inflow on free flap survival. *J Reconstr Microsurg*. 2002;18:579–584.
10. Komatsu S, Tamai S. Successful replantation of a completely cut-off thumb: case report. *Plast Reconstr Surg*. 1968;42:374–377.